

supported flat horizontal steel plate which is 50.8 mm (2 in) thick and 610 mm (24 in) square. The impact surface shall be clean, dry and have a micro finish of not less than  $203.2 \times 10^{-6}$  mm (8 micro inches) (RMS) and not more than  $2032.0 \times 10^{-6}$  mm (80 micro inches) (RMS).

(5) Allow at least 2 hours between successive tests on the same head.

**§572.123 Neck assembly and test procedure.**

(a) The neck assembly for the purposes of this test consists of the assembly of components shown in drawing 127-1015.

(b) When the head-neck assembly consisting of the head (drawing 127-1000), neck (drawing 127-1015), pivot pin (drawing 78051-339), bib simulator (drawing TE127-1025, neck bracket assembly (drawing 127-8221), six-axis neck transducer (drawing SA572-S11), neck mounting adaptor (drawing TE-2208-001), and three accelerometers (drawing SA572-S4) installed in the head assembly as specified in §572.122, is tested according to the test procedure in paragraph (c) of this section, it shall have the following characteristics:

(1) *Flexion.* (i) Plane D, referenced in Figure N2, shall rotate in the direction of preimpact flight with respect to the pendulum's longitudinal centerline between 74 degrees and 92 degrees. Within this specified rotation corridor, the peak moment about the occipital condyles shall be not less than 27 N-m (19.9 ft-lbf) and not more than 33 N-m (24.3 ft-lbf).

(ii) The positive moment shall decay for the first time to 5 N-m (3.7 ft-lbf) between 103 ms and 123 ms.

(iii) The moment shall be calculated by the following formula: Moment (N-m) =  $M_y - (0.01778m) \times (F_x)$ .

(iv)  $M_y$  is the moment about the y-axis and  $F_x$  is the shear force measured by the neck transducer (drawing SA572-S11) and 0.01778m is the distance from force to occipital condyle.

(2) *Extension.* (i) Plane D, referenced in Figure N3, shall rotate in the direction of preimpact flight with respect to the pendulum's longitudinal centerline between 85 degrees and 103 degrees. Within this specified rotation corridor, the peak moment about the occipital

condyles shall be not more than -19 N-m (-14 ft-lbf) and not less than -24 N-m (-17.7ft-lbf).

(ii) The negative moment shall decay for the first time to -5 N-m (-3.7 ft-lbf) between 123 ms and 147 ms.

(iii) The moment shall be calculated by the following formula: Moment (N-m) =  $M_y - (0.01778m) \times (F_x)$ .

(iv)  $M_y$  is the moment about the y-axis and  $F_x$  is the shear force measured by the neck transducer (drawing SA572-S11) and 0.01778m is the distance from force to occipital condyle.

(3) Time-zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material.

(c) *Test procedure.* The test procedure for the neck assembly is as follows:

(1) Soak the neck assembly in a controlled environment at any temperature between 20.6 and 22.2 °C (69 and 72 °F) and a relative humidity between 10 and 70 percent for at least four hours prior to a test.

(2) Torque the jam nut (drawing 9000341) on the neck cable (drawing 127-1016) to  $0.23 \pm 0.02$  N-m ( $2.0 \pm 0.2$  in-lbs).

(3) Mount the head-neck assembly, defined in paragraph (b) of this section, on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum as shown in Figure N2 for flexion tests and Figure N3 for extension tests.

(4) Release the pendulum and allow it to fall freely from a height to achieve an impact velocity of  $4.95 \pm 0.12$  m/s ( $16.2 \pm 0.4$  ft/s) for flexion tests and  $4.3 \pm 0.12$  m/s ( $14.10 \pm 0.40$  ft/s) for extension tests, measured by an accelerometer mounted on the pendulum as shown in Figure 22 of 49 CFR 572 at the instant of contact with the honey comb.

(i) Time-zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. All data channels should be at the zero level at this time.

(ii) Stop the pendulum from the initial velocity with an acceleration vs. time pulse which meets the velocity change as specified below. Integrate the pendulum acceleration data channel to obtain the velocity vs. time curve:

TABLE B

Time	Pendulum pulse			
	Flexion		Extension	
	m/s	ft/s	m/s	ft/s
10 .....	1.2–1.6	3.9–5.3	1.0–1.4	3.3–4.6
20 .....	2.4–3.4	7.9–11.2	2.2–3.0	7.2–9.8
30 .....	3.8–5.0	12.5–16.4	3.2–4.2	10.5–13.8

#### § 572.124 Thorax assembly and test procedure.

(a) *Thorax (upper torso) assembly.* The thorax consists of the part of the torso assembly shown in drawing 127–2000.

(b) When the anterior surface of the thorax of a completely assembled dummy (drawing 127–0000) is impacted by a test probe conforming to section 572.127(a) at  $6.71 \pm 0.12$  m/s ( $22.0 \pm 0.4$  ft/s) according to the test procedure in paragraph (c) of this section:

(1) The maximum sternum displacement (compression) relative to the spine, measured with chest deflection transducer (drawing SA572-S50), must be not less than 38.0 mm (1.50 in) and not more than 46.0 mm (1.80 in). Within this specified compression corridor, the peak force, measured by the probe in accordance with section 572.127, shall not be less than 1150 N (259 lbf) and not more than 1380 N (310 lbf). The peak force after 12.5 mm (0.5 in) of sternum displacement but before reaching the minimum required 38.0 mm (1.5 in) sternum displacement limit shall not exceed 1500 N (337.2 lbf).

(2) The internal hysteresis of the ribcage in each impact as determined by the plot of force vs. deflection in paragraph (b)(1) of this section shall be not less than 65 percent but not more than 85 percent.

(c) *Test procedure.* The test procedure for the thorax assembly is as follows:

(1) Soak the dummy in a controlled environment at any temperature between 20.6° and 22.2 °C (69° and 72 °F) and a relative humidity between 10 and 70 percent for at least four hours prior to a test.

(2) Seat and orient the dummy, wearing tight-fitting underwear or equivalent consisting of a size 5 short-sleeved shirt having a weight less than 0.090 kg (0.2 lb) and an opening at the top just large enough to permit the passage of

the head with a tight fit, and a size 4 pair of long pants having a weight of less than 0.090 kg (0.2 lb) with the legs cut off sufficiently above the knee to allow the knee target to be visible, on a seating surface without back support as shown in Figure N4, with the limbs extended horizontally and forward, parallel to the midsagittal plane, the midsagittal plane vertical within  $\pm 1$  degree and the ribs level in the anterior-posterior and lateral directions within  $\pm 0.5$  degrees.

(3) Establish the impact point at the chest midsagittal plane so that the impact point of the longitudinal centerline of the probe coincides with the midsagittal plane of the dummy within  $\pm 2.5$  mm (0.1 in) and is  $12.7 \pm 1.1$  mm (0.5  $\pm 0.04$  in) below the horizontal-peripheral centerline of the No. 3 rib and is within 0.5 degrees of a horizontal line in the dummy's midsagittal plane.

(4) Impact the thorax with the test probe so that at the moment of contact the probe's longitudinal center line falls within 2 degrees of a horizontal line in the dummy's midsagittal plane.

(5) Guide the test probe during impact so that there is no significant lateral, vertical or rotational movement.

(6) No suspension hardware, suspension cables, or any other attachments to the probe, including the velocity vane, shall make contact with the dummy during the test.

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#### § 572.125 Upper and lower torso assemblies and torso flexion test procedure.

(a) *Upper/lower torso assembly.* The test objective is to determine the stiffness effects of the lumbar spine (drawing 127–3002), including cable (drawing 127–8095), mounting plate insert (drawing 910420–048), nylon shoulder bushing